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CATTLE LICE AND HOW TO ERADICATE THEM

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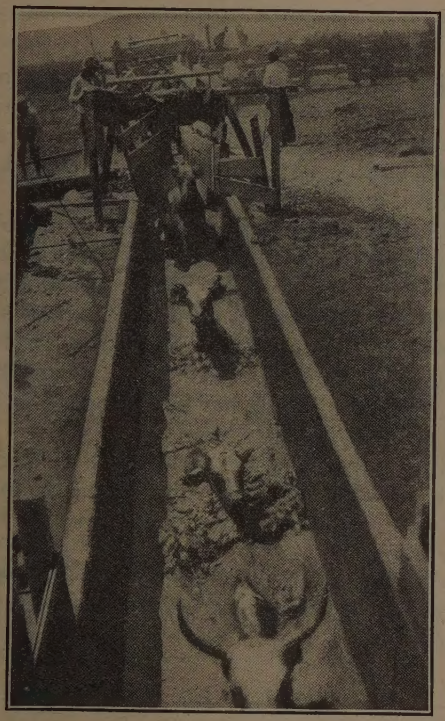

FARMERS' BULLETIN 909

UNITED STATES DEPARTMENT OF AGRICULTURE

Contribution from the Bureau of Animal Industry
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CATTLE LICE are injurious to all classes of cattle, but the greatest losses occur in young stock and poorly nourished old animals. The losses are caused by irritation, digestive disturbances, arrested growth, low vitality, and increased death rate.

Three kinds of lice are commonly found on cattle, and all three species may be present on the same animal at the same time. The same method of treatment may be used for the three species.

Methods of treatment include hand applications, spraying, and dipping. The first two methods are suitable only for small herds. Dipping is the best method of applying treatment.

Arsenical dips, coal-tar creosote dips, and nicotin solutions may be used for dipping cattle to destroy lice. Two or more treatments should be given 15 to 16 days apart.

Plans of cattle-dipping plants and directions for building vats and dipping cattle are given in this bulletin.

CATTLE LICE AND HOW TO ERADICATE THEM.

CONTENTS.

	Page.		Page.
Distribution and economic importance	3	Methods of treatment	8
Suctorial lice	4	Directions for dipping	11
Biting lice	5	Dips for cattle lice	14
Nature and habits	6	Dipping plants	17

DISTRIBUTION AND ECONOMIC IMPORTANCE.

CATTLE LICE are widely distributed and have been recognized as a pest by live-stock growers since early times. These parasites are more or less prevalent in all parts of the United States, especially where cattle are held in large herds or crowded into badly kept and poorly ventilated stables. In the western range country cattle often become infested very heavily with lice, the degree of infestation varying from year to year with climatic and other conditions. In the farming communities the parasites usually are most prevalent on underfed and poorly housed cattle, although they may occur on animals in good flesh and kept in properly ventilated sanitary quarters.

Ordinarily lice on cattle are not observed until they become so numerous that they cause unmistakable signs of annoyance. Usually the animals whose lousy condition first attracts attention are the poor, weak, unthrifty members of the herd, and frequently the owner thinks they are lousy because they are unthrifty, whereas the unthrifty condition may be caused by the lice. As a rule the individual members of a herd are not affected equally, as some cattle seem to be unsuitable hosts to such an extent that they may be considered practically immune. However, when lice are introduced into a herd during the fall or winter they usually spread rapidly until every animal or nearly every animal is infested.

All kinds of cattle lice obtain their food from the tissues of their host, and the irritation caused by the parasites is evidenced by the efforts of infested animals to obtain relief by rubbing and scratching. When a herd is grossly infested it is not uncommon to see some of the animals with large areas of skin partly denuded of hair and limited areas bruised and raw from rubbing against posts and other objects. The irritation, and conditions caused thereby, result in

more loss than is commonly supposed. The lowering of the vitality and the general unthrifty condition produced by lice often result in an increased percentage of death loss among cattle during unfavorable seasons.

Calves, young stock, and old, weak, poorly nourished cattle suffer most from the ravages of lice. Heavily infested calves do not grow and thrive or gain weight normally during the winter season, and often remain stunted until the old coat of hair is shed in the spring, when most of the lice disappear. The animals then may grow and fatten, but the loss experienced during the period of arrested growth is a loss not easily regained. Lice act as a contributing cause to increase the death rate among poorly nourished cattle of low vitality, especially old range cows exposed to inclement weather. Although mature cattle in full vigor suffer less seriously from infestation with lice, nevertheless if they become very lousy they will not gain weight and there will be a loss in the production of either meat or milk. The damages and losses caused by lice are of sufficient importance to warrant careful consideration and the application of proper treatment.

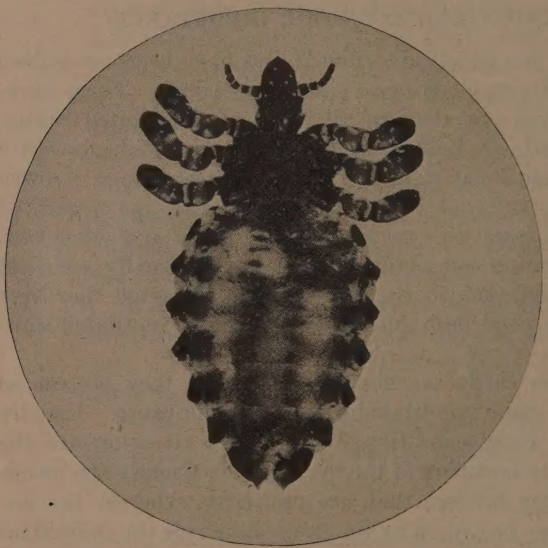

FIG. 1.—Short-nosed cattle louse (*Hæmatopinus eurysternus*). Female. (Magnified about 20 times.)

Three kinds or species of lice are commonly found on cattle in the United States. Two of these are blood suckers, or suctorial lice, and are commonly known as "blue lice." The third species is a biting louse commonly known as the "little red louse."

SUCTORIAL LICE.

The short-nosed cattle louse (*Hæmatopinus eurysternus*, fig. 1)[1] usually is found on mature cattle, although it may occur on calves and young stock. The average length of adult females is about one-eighth of an inch and the body is about one-half as broad as

[1] Figures 1 to 3 are from photomicrographs by Dr. W. T. Huffman.

long. The males are slightly smaller than the females. The head is short, nearly as broad as long, and is bluntly rounded in front. The head and thorax are yellowish brown, while the abdomen is blue slate colored.

These lice pass the various stages of their life on the animal. The eggs, commonly called "nits," are attached firmly to the hairs, usually close to the skin, and they hatch on the animal in 11 to 18 days, the average period of incubation during mild weather being about 14 days. The young females begin to lay eggs when they are about 12 days old.

The long-nosed cattle louse (*Linognathus vituli*, fig. 2) usually is found on calves and young stock, but sometimes occurs on mature cattle. Although in their adult stage these lice have about the same general color as the short-nosed lice, the two species may be distinguished easily. As implied by the term "long-nosed," the head is long and slender, and the body is only about one-third as broad as long, thus giving the entire body a more slender appearance than that of the short-nosed species.

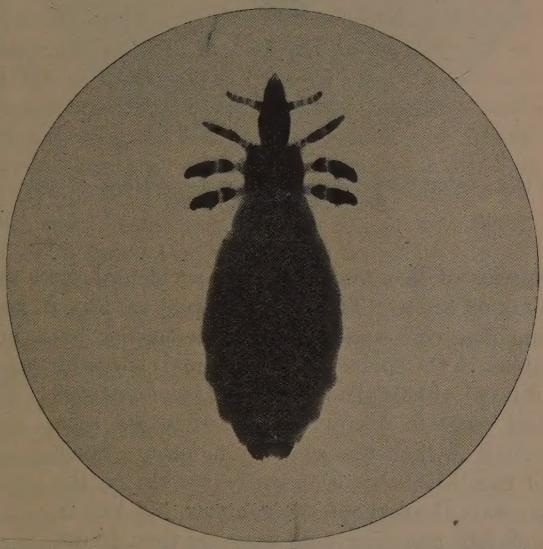

FIG. 2.—Long-nosed cattle louse (*Linognathus vituli*). Female. (Magnified about 20 times.)

These lice pass their entire life on the animal and deposit eggs in the same general manner as the other species. The eggs hatch in 10 to 14 days, the average period of incubation being about 12 days. The young females reach sexual maturity and begin laying eggs about 11 days from the date of hatching.

BITING LICE.

The common biting lice of cattle (*Trichodectes scalaris*, fig. 3) are found on both young and mature cattle. They are much smaller than the sucking lice, but are visible to the naked eye. The head is broad and blunt, the color is reddish, that of the body commonly

FIG. 3.—Biting louse of cattle (*Trichodectes scalaris*). Female. (Magnified about 20 times.)

yellowish white. They may be distinguished readily from the sucking species by the general shape of the head and body and by the color.

The life history is similar to that of the sucking lice. The average period of incubation is probably about 10 days. The eggs or "nits" are shown in figure 4.

NATURE AND HABITS.

Each species of domestic animals has its own particular species of lice, and except in accidental cases cattle lice are found only on cattle. They increase very rapidly in number on cattle during dry, cold weather when the hair is long, but when green feed comes in the spring and the animals shed the old coat of hair the lice become less numerous and seem to disappear, and they are seen rarely during the summer months. Some of the lice, however, usually remain on the animals throughout the summer, but not in sufficient numbers to do harm, as they do not increase rapidly while the animals are on green feed and in a thriving condition. With the coming of winter, when conditions again become favorable, the lice increase very rapidly. Treatment therefore should be applied in the fall while the weather is suitable and before the lice have become numerous enough to cause injury.

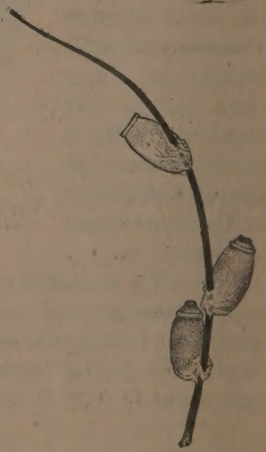

FIG. 4.—Eggs or nits of biting louse on a hair. The two lower eggs are unhatched; the upper one has hatched. (Magnified about 20 times.)

The sucking lice usually select locations where they are partly protected from the efforts of the animals to dislodge them. The favorite locations are the sides of the neck,

brisket, back, inner surface of the thighs, and on the head, around the nose, eyes, and ears. When animals are very lousy the entire surface of the body may become involved. The sucking lice obtain their food by puncturing the skin of the host and feeding on the blood and lymph. When feeding they attach themselves to the skin by burying their sucking tubes in the tissues. When not feeding they move about over the hair and skin.

The biting lice usually are found on the withers and around the root of the tail, but they may occur on any part of the body. They apparently feed on particles of hair, scales, and exudations from the skin. Ordinarily they do not irritate the animals as much as sucking lice. When present in large numbers, however, they often form colonies or groups around the base of the tail, over the withers, and on other parts of the animal, and produce lesions resembling those of scab. These lesions vary in size from that of a 25-cent piece to 4 or 5 inches in diameter. The skin over these areas appears to be raised and ringworm may be suspected, but when the lesion is manipulated the scarf skin falls off, exposing the lice grouped on the raw tissues beneath. Under such conditions the irritation is very great and the damage to the animal may be fully equal to that caused by scab.

When separated from their hosts the biting lice live about 7 days, the sucking lice only about 4 days. Ordinarily eggs are not deposited except on the host, but when the hair to which they are attached is removed and kept under fairly favorable conditions, they may continue to hatch for as long as 20 days. The newly hatched lice live only 2 or 3 days unless they find a host.

The longevity of the lice and the viability of their eggs when separated from the host have an important bearing on the problem of eradication. The parasites and eggs may become dislodged from the animals, drop in the corrals, stables, and pastures, and temporarily infest the premises. It seems reasonably certain that all lice that remain off the animals, even under the most favorable conditions, die within 7 or 8 days, and if the weather is cold and conditions unsuitable they die in less time. The eggs dislodged from the animals, however, may continue to hatch if the weather is mild, and thus be the means of temporarily infesting the premises.

Before using infested corrals or premises such as stables, sheds, or lots for clean or dipped cattle they should be cleaned and disinfected as a precaution against reinfection from dislodged lice and eggs. Remove all litter and manure, cleaning down to a smooth surface, then spray all walls, woodwork, and floors with a good disinfectant. The coal-tar creosote dips, diluted in accordance with instructions on the container, are suitable for this purpose. After dipping or treating animals to free them from lice they should be

taken to clean premises and not returned to the quarters previously occupied unless such quarters in the meantime have been cleaned and disinfected or held vacant for about 20 days.

The long-nosed sucking lice and the biting lice are much more easily eradicated than the short-nosed sucking lice. One treatment with arsenical dip or coal-tar creosote dip usually is sufficient to eradicate the former, but as a rule one treatment does not eradicate the short-nosed sucking lice. In fact, two treatments sometimes fail to eradicate the last-named species, especially in the case of infested bulls. When a herd is infested with all three species the animals should be given two treatments separated by an interval of 15 to 16 days. After the second treatment the cattle should be examined at frequent intervals, and if live lice are found a third treatment should be given in about 16 days following the second.

METHODS OF TREATMENT.

There are three commonly used methods of applying treatment for lice: First, hand applications; second, spraying; third, dipping. The best method to adopt naturally depends upon the season of the year, the remedies selected, the number of cattle to be treated, and the facilities available. In southern latitudes, where the winters are mild, cattle may be dipped during the winter months without injury from cold weather; but in the northern sections the weather during the winter season is usually too cold for dipping or spraying. As hand applications are practicable only when a few animals are to be treated, it is important that herds in which lice appeared during the winter be dipped the following spring or fall. Fall dipping is good insurance against both the risk of loss from lice and the probable additional expense of winter treatment. All animals in the herd should be treated regardless of the number showing infestation. If only part of the herd is treated, or if after the second treatment the animals are returned to infested premises, the parasites may spread by contact of one animal with another, or by contact with infested premises, and the herd almost certainly will become reinfested.

HAND APPLICATIONS.

Dusting powders.—The insecticidal value of many of the dusting powders is dependent upon their naphthalene and pyrethrum content, and they are of value in helping to hold in check the parasites during the season when the weather is too cold for dipping or spraying. They are sold under various trade names, but as a class they are not recommended as successful remedies for eradicating cattle lice.

Greases and liquids.—This group consists mostly of homemade remedies, which are fairly effective and practicable in cases where a farmer has only a few animals to treat and gives the matter his personal attention. While hand treatment is more or less of a makeshift even under the best conditions, it is, nevertheless, sometimes necessarily adopted. The following remedies have proved effective when applied by hand and the treatment repeated, if necessary, in about 16 days: (1) Cottonseed oil and kerosene, equal parts; (2) kerosene and lard mixed in the proportion of ½ pint kerosene to 1 pound of lard; (3) crude petroleum; (4) any of the dips recommended for use in dipping.

The first three remedies are suitable for use during mild weather, but if animals are to be treated during very warm or very cold weather it is advisable to use some of the dips instead of the oils, as the latter are liable to cause injury if the freshly treated cattle are moved rapidly, exposed to bright sunshine, or become chilled.

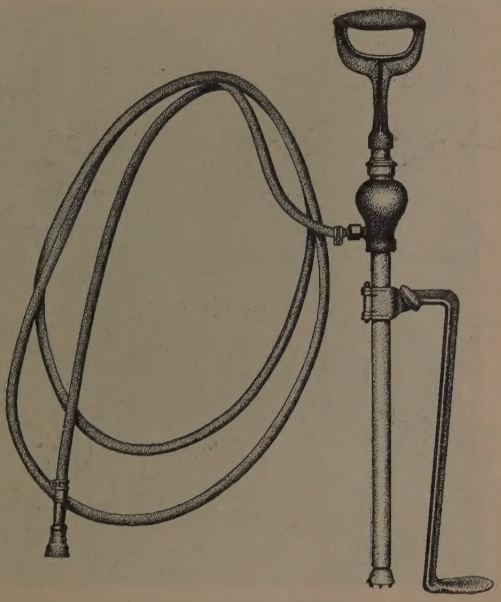

FIG. 5.—Small spray pump suitable for spraying cattle to destroy lice.

These remedies may be applied with a brush or a cloth. They should be distributed in a thin even coating over the surface of the head and body, including the inner surface of the ears, care being taken to see that there is no excess quantity at any point. When a dip is used for hand treatment it should be applied liberally after proper dilution over every portion of the body surface including the inner surfaces of the ears and between the thighs.

SPRAYING.

On farms where the number of animals is not large enough to justify the owner in providing a dipping vat, a spray pump may be used to advantage. Where an orchard spraying outfit is available it may be utilized for spraying animals. A small spray pump (fig.

5), which, equipped with hose and nozzles, can be purchased for less than $10, is convenient for the purpose.

Any of the dips recommended for lice may be applied in the form of a spray, and while spraying is usually not as effective as dipping, nevertheless, if the work is done well and carefully the lice can be eradicated by spraying. Two treatments should be given 15 to 16 days apart. At each spraying it is important that every portion of the surface of the body receive the maximum possible wetting, special attention being given to the head, ears, brisket, tail, and inner surfaces of the elbows, flanks, and thighs. (Fig. 6.)

FIG. 6.—Treatment for lice by means of a spray pump.

When arsenical dip is used care should be taken to see that neither the animal nor the operator breathes the spray. The operator should also be careful not to get his clothing wet with the dip.

DIPPING.

Dipping consists in immersing animals in a medicated liquid that will kill the lice. It is the most successful known method of applying treatment for lice. Dipping plants are usually arranged so that the cattle enter one end of a vat filled with dip, through which they swim, and leave the vat at the opposite end (see illustration on front page).

One dipping sometimes eradicates the lice, but it can not be depended upon in practical operations, especially when the animals are infested with the short-nosed sucking lice. The first dipping if properly done may kill all the lice or cause them to leave the animals, but it may not destroy all the eggs. Some of the eggs often survive the first dipping and hatch, thus forming a new generation of lice. To complete the treatment this new generation should be destroyed by a second dipping before they have had time to develop to maturity and deposit eggs. On the other hand, the second dipping should be delayed long enough to give the eggs which were laid before the first dipping sufficient time to hatch; otherwise they may hatch after the second dipping and reinfest the cattle. Because of overlapping of the two periods and of variations in the incubation period and the period required for lice to reach maturity it does not seem possible to meet both of these conditions in establishing the length of the interval between dippings, but a period of 15 to 16 days has generally given satisfactory results.

When conditions are such that an infested herd can not be dipped twice, one dipping in arsenical solution or coal-tar creosote dip will amply repay the cost and effort. If complete eradication is desired, however, two dippings should be given with an interval of 15 to 16 days between dippings, and sometimes a third dipping may be necessary.

DIRECTIONS FOR DIPPING.

If dipping is to be successful it is necessary to give close attention to details and see that the work is performed carefully and thoroughly. Before bringing cattle to the vat they should be watered and fed so as not to be hungry or thirsty at the time of dipping; on the other hand, they should not be gorged with feed and water when dipped. If they are watered and fed two to four hours before dipping, they are likely to be in the best condition for the operation. When cattle have been driven and are hot at the time of reaching the vat, they should be allowed to cool off before they are dipped, as it is dangerous to dip animals while they are hot. When the nights are cold dipping should be finished for the day early enough for the animals to become dry before sunset.

The dip in the vat should be maintained during dipping at a depth of 70 to 80 inches, or sufficient to swim the tallest animal to be dipped. The quantity of dip necessary to obtain that depth should be ascertained before it is prepared. The average 1,000-pound short-haired steer will carry out and retain about 2 quarts of dip, and the same class of cattle with long hair will retain about 1 gallon each. The total estimated amount of dip which the animals carry out and retain,

plus the amount required to charge the vat, should equal the total amount required, if none is lost by leakage or otherwise wasted.

The capacity of the vat is usually obtained in the following manner: Multiply the average length by the average width in inches, then the product by the depth; this will give approximately the number of cubic inches of space to be filled with dip. Divide this by 231 (the number of cubic inches in a gallon), and the result will be approximately the number of gallons of dip required to charge the vat.

To obtain the average length, add the length at the bottom to the length at the top (that is, at the line to which the vat is to be filled), and divide this sum by 2. Obtain the average width in the same manner. The depth should be taken at the center of the vat, and should be from bottom to dip line only and not to the top of the vat. Likewise, in determining the length and width, measure only the space to be filled with liquid and not above that line. The capacities of the various tanks are obtained by a like process. Gauges or rods should be prepared and marked to show the number of gallons at various depths in the vat and tanks.

FIG. 7.—Stirring plunger for mixing liquids in the vat.

After the vat is filled to the required depth the contents should be mixed well by stirring, in order that the dip may be of uniform strength throughout. A good method of stirring dip is to take a pail or an empty dip container in which a wire bail has been fastened, attach a rope or dipping fork to the bail, allow the vessel to fill and partially sink, then drag it rapidly from one end of the vat to the other, repeating the operation several times. Stirring plungers also are useful implements, and as they are easily made, one or more should be provided at every vat. Their use is similar to that of the dasher of an old-fashioned hand churn. The plunger is pushed to the bottom of the vat and raised rapidly, the process being repeated as the operator moves slowly along the vat. The style shown in figure 7 is one commonly used.

Before beginning dipping operations the pens, chutes, slide board, vat, etc., should be examined for projecting nails, broken boards, or any object that may puncture or wound the cattle, as the dip may injure those having fresh wounds. The animals should be handled as carefully as possible, although in dipping wild range cattle the attendants can exercise very little control in the matter. Range cattle,

not accustomed to being handled, are easier to dip than tame farm animals, as they go through the chutes and enter the vat more readily than the tame animals. After the animals have started running through the chute it is often necessary to restrain them to prevent their piling up and drowning in the vat. At large dipping plants a gate is usually provided in the chute near the intake to the vat so the animals in the chute may be held back and allowed to pass only as room is made for them in the vat. If the chute has no gate, a bar which can be slipped across the chute between the side boards will answer the purpose. Gentle farm animals, and especially old milk cows, usually do not enter the vat readily—in fact, often it is necessary to push them on the slide board.

In dipping cattle for lice it is not necessary to hold them in the vat, but they should be completely submerged and the head ducked at least once. When the heads are ducked the air inclosed in the ears may prevent the dip from wetting the inner surfaces of the ears or coming in contact with the lice attached in the lower folds. Therefore care should be taken to see that the dip enters the ears of each animal as it passes through the vat. This may be accomplished by pushing the heads low enough in the dip so the liquid fills the ears or by splashing the dip with an old broom over and into the ears.

FIG. 8.—Two styles of cattle-dipping forks.

Men with dipping forks should be stationed along the vat to duck the heads of the animals and render assistance in case any of them become strangled. The two styles of dipping forks shown in figure 8 are the ones commonly used. They may be bought ready-made or may be made to order by the blacksmith.

After the cattle leave the vat they should be held in the draining pens or corrals until all surplus dip has drained off them. They should not be driven long distances or moved rapidly within 24 hours or even longer after dipping, as injury may result from too

much exercise or overheating shortly after dipping, especially if arsenical dip or oil is used.

The dip in the vat should be changed as soon as it becomes filthy, regardless of the number of animals that may have been dipped in it. In cleaning the vat the entire contents should be removed, including all sediment and foreign matter.

DIPS FOR CATTLE LICE.

In choosing a dip for cattle lice the conditions under which it is to be used should be considered. If the dipping plant is supplied with soft water, any of the dips recommended for lice may be used; but if the water is very hard the dip that mixes best with the water available should be selected. The arsenical dip mixes well and may be used in hard waters without injury to the animals from that cause. The nicotin dips also are suitable for use in any reasonably good water. While the coal-tar creosote dips when used in soft water are very effective against lice, they sometimes injure the animals when used in some of the hard waters. Before using coal-tar creosote dips with hard or alkaline water the following test should be made to learn whether a separation occurs in such water: In a clean bottle or jar of clear glass place a measured quantity of dip and pour in, with thorough mixing, the desired quantity of water, preferably warm, which should be added in approximately the proportion to be used in dipping. If after standing for one hour an oily layer or a mass of globules appears either at the top or at the bottom of the liquid, the dip should not be used with that kind of water. This simple test for the coal-tar creosote dips may often prevent loss. Death losses, however, may occur even when there is no apparent separation of the diluted dip tested by this method.

None of the dips tried in the bureau's investigations can be depended upon to eradicate all cattle lice with one dipping, but any of those described in the following pages will generally eradicate lice if the cattle are given two dippings 15 to 16 days apart.

ARSENICAL DIPS.

Arsenical dip has been used to a considerable extent for lice and it has proved to be a very satisfactory remedy. The formula for making 500 gallons of arsenical dip is as follows.[1]

4 pounds caustic soda (85 per cent pure).
8 pounds white arsenic (99 per cent pure), in fine powder.
8 pounds sal soda crystals.
1 gallon pine tar.
Water sufficient to make 500 gallons.

[1] For fuller information relative to arsenical dip see Farmers' Bulletin No. 603.

Place the caustic soda in a clean iron tank, tub, or pail, add 1 gallon of cold water, and stir until the caustic soda is dissolved. Then begin adding the arsenic, a pound or two at a time, as fast as it can be dissolved without causing the solution to boil, stirring all the time. If the liquid begins to boil stop stirring and let it cool slightly before adding more arsenic. The secret of success is to add the arsenic fast enough to keep the solution very hot, but not quite at the boiling point. The result should be a clear solution except for the dirt. If the liquid is muddy or milky add 1 gallon of water and stir, and if it does not clear up place the container over a fire and heat nearly but not quite to boiling and stir. As soon as the solution of arsenic is complete, dilute to about 4 gallons, add the sal soda, and stir until dissolved. After the solution has become cold add water to make it exactly 5 gallons.

Emulsify the pine tar as follows: Dissolve three-fourths of a pound of dry caustic soda or concentrated lye (or 1 pound of dry caustic potash) in 1 quart of water, add 1 gallon of pine tar, and stir until the mixture brightens to a uniform thick fluid somewhat resembling molasses. Test it by letting about a spoonful drip from the stirring paddle into a glass of water. It should mix perfectly with the water. If globules appear which can not be blended with the water by repeated stirring add more dissolved caustic soda, a little at a time, until the desired effect is produced.

The arsenical stock solution and the emulsified tar prepared as directed are sufficient to make 500 gallons of dip. Therefore, 1 gallon of the arsenic stock and about 1 quart of the tar stock added to approximately 99 gallons of water makes 100 gallons of dip. The quantity of stock solution prepared at any one time is limited only by the capacity of the available containers, but the proportion of the ingredients should not be altered.

Before adding the arsenic and tar stock to the bath fill that part of the vat below the dip line about three-fourths full of water. Then dilute the emulsified tar with about two or three times its volume of water and add it to the water in the vat, taking care to pour it evenly over the entire surface of the water throughout the length of the swim. Add the arsenical solution in the same manner; then add sufficient water to bring the liquid in the vat up to the dip line, stirring thoroughly.

Manufacturers have placed on the market several brands of ready-prepared arsenical dips, and any of these, if permitted by the Government for use in dipping cattle for southern fever ticks, are suitable for dipping cattle for lice.

In preparing and using arsenical dip it should be remembered that arsenic is a poison, and due precaution should be taken to avoid

injury. However, when it is handled and used with proper care it is a safe and efficacious remedy. The arsenic, as well as the other ingredients, should be weighed carefully. While the arsenical solution is being prepared care should be taken not to inhale the powder or the vapor given off, and the operator should stand on the windward side of the kettle as far away as possible. Care should be taken not to expose, more than necessary, the hands or other parts of the body to the action of the dip. The hands should be washed frequently and care taken not to get the clothing wet with the dip.

If animals are allowed to drain where pools of dip collect from which they may drink, or if they are turned into feed lots or pastures while the dip is dripping from their bodies so that the feed may become soiled, losses are liable to occur.

The arsenical dip left in the vat may be used again if it is not filthy. When not in use the vat should be covered or inclosed by a fence so that animals may not have access to it. In cleaning the vat the contents should not be emptied or allowed to flow into streams or on land or vegetation to which animals have access. The best plan is to run the dip into a pit or trench constructed for that purpose and protected by fences. The trench should be located so the dip will not be carried by seepage into the water supply of the farm or the neighborhood.

Although the arsenical dip is commonly used cold, it should not be cold enough to chill the animals. The temperature should range between 65° and 90° F.

COAL-TAR CREOSOTE DIPS.

The coal-tar creosote dips are sold under many trade names. They are made from coal-tar derivatives and the principal ingredient is creosote oil, which is made soluble in or miscible with water by means of soap. When diluted with soft water they are efficacious in eradicating cattle lice. Before using them with hard or alkaline water the test described on page 14 should be made. There is no field test for determining the deterioration of these dips, consequently in replenishing the dip the percentage of active ingredients in the vat is largely a matter of guesswork. Coal-tar creosote dips may be used cold or warm, but the temperature of the bath should not exceed 95° F.

These dips should contain, when diluted ready for use, not less than 1 per cent by weight of coal-tar oils and cresylic acid. In no case should the diluted dip contain more than four-tenths of 1 per cent nor less than one-tenth of 1 per cent of cresylic acid; but when the proportion of cresylic acid falls below two-tenths of 1 per cent the coal-tar oils should be increased sufficiently to bring the total of

the tar oils and the cresylic acid in the diluted dip up to 1.2 per cent by weight.

In the undiluted coal-tar creosote dips, especially in cold weather, a separation of naphthalene and other constituents of the dip may occur. Care, therefore, should be taken to see that the dip is homogeneous in character before using any portion of it.

The coal-tar creosote dips should be used in accordance with the instructions printed on the label of the container.

NICOTIN DIPS.

The nicotin dips are sold under various trade names, and farmers and live-stock growers are more or less familiar with them from using them as dips for animals and as insecticides for insect pests of plants. They are efficacious remedies for cattle lice when diluted with water so that the solution contains not less than five one-hundredths of 1 per cent of nicotin. If used much stronger than 0.05 per cent they are liable to injure cattle, especially if the animals are dipped while they are hot, but if properly used they cause no injury. A field test has been designed by one of the large manufacturers of nicotin dips so the percentage of nicotin in the dipping bath may be ascertained at the vat side at any time. Nicotin dips should be used in accordance with the instructions printed on the label of the container. Do not use any preparation the strength of which is not given on the label.

Nicotin dips usually are used warm, but should not be heated above 110° F. During dipping operations for lice the temperature of the dip should be maintained at 90° to 95° F.

Sulphur is sometimes added to nicotin dips in the proportion of 16 pounds flowers of sulphur to 100 gallons of diluted dip. Very little of the sulphur is dissolved in the dip, but a part of it remains in suspension in the bath during dipping and becomes lodged on the skin of the animal, where it remains for a long time, thus tending to prevent reinfestation.

DIPPING PLANTS.

The farmer who has but a small number of animals to dip may use a portable galvanized metal vat (fig. 9). These vats may be purchased ready-made, and they will answer the purpose very well for dipping small lots of light or medium weight cattle. After digging a trench and setting the vat so that the top is flush with the surface of the ground, a chute and a slide board should be provided as a means of getting the animals into the vat.

A permanent dipping plant is much more satisfactory, and where there are a number of farmers in a community who want to dip their

cattle a good plan is for each to contribute in proportion to the number of cattle owned and use the fund for building a community dipping plant. In designing or selecting a plan for a dipping plant it is well to remember that the vat should be constructed so as to be suitable for use in dipping for scab as well as for lice and other parasites.

Two styles of dipping plants are shown in the plans (figs. 10 and 11). Either of these is suitable for dipping cattle or horses for any purpose. The chutes, draining pens, etc., shown in one set of plans may be substituted if desired for those shown in the other.

If a dip is to be used which requires cooking and settling, such as homemade lime-sulphur, commonly employed in the treatment of scab, it is necessary to provide boiling and settling tanks (fig. 12).

SELECTING A LOCATION.

In selecting a location for a dipping plant the fact that animals work better up grade should be considered, and the corrals and running chute should slope up to the entrance end of the vat. The vat should be on level ground, preferably extending north and south

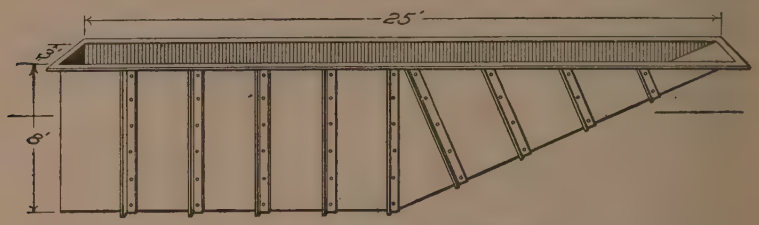

FIG. 9.—Portable galvanized metal dipping vat.

with the entrance at the south and the exit at the north, as it has been observed that animals work better when not facing the sun. A considerable quantity of water is used in dipping, so the dipping plant should be located close to an adequate supply. The vat, however, should not be located on low, marshy land or where flood waters overflow.

CORRALS AND CHUTES.

The receiving corrals, into which the animals are driven preparatory to dipping, as well as the holding corrals, into which they go from the draining pens, should each be large enough to hold the largest herd to be dipped. They should be constructed so that there may be the least possible number of corners in which the cattle may become crowded and injured.

The proper design and construction of the chutes is important, because improperly constructed chutes add greatly to the difficulty

of getting cattle into the vat and often cause rough handling of the animals. The running chute should be at least 30 feet long and

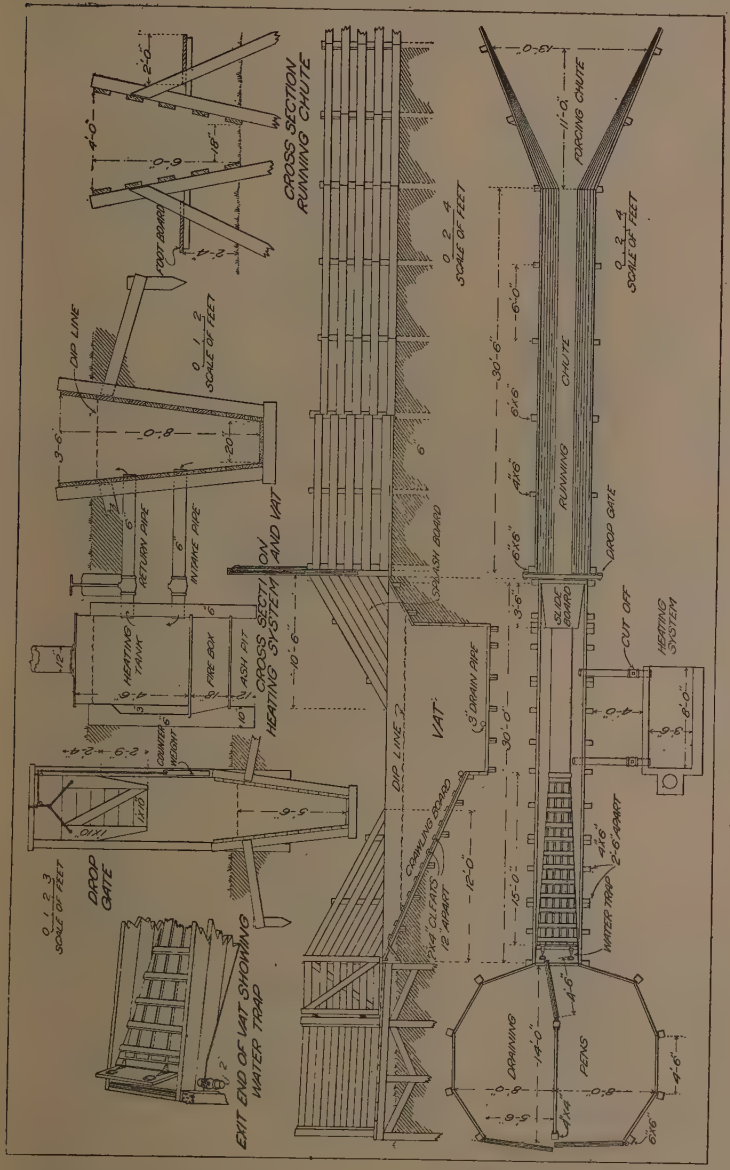

Fig. 10.—Plan of cattle-dipping plant with wooden vat.

preferably curved to obstruct the view of animals approaching the vat. Two styles of running chutes and crowding chutes are shown in

the plans, and dimensions and structural details are given. Two styles of chute gates are also shown. Most stockmen probably will

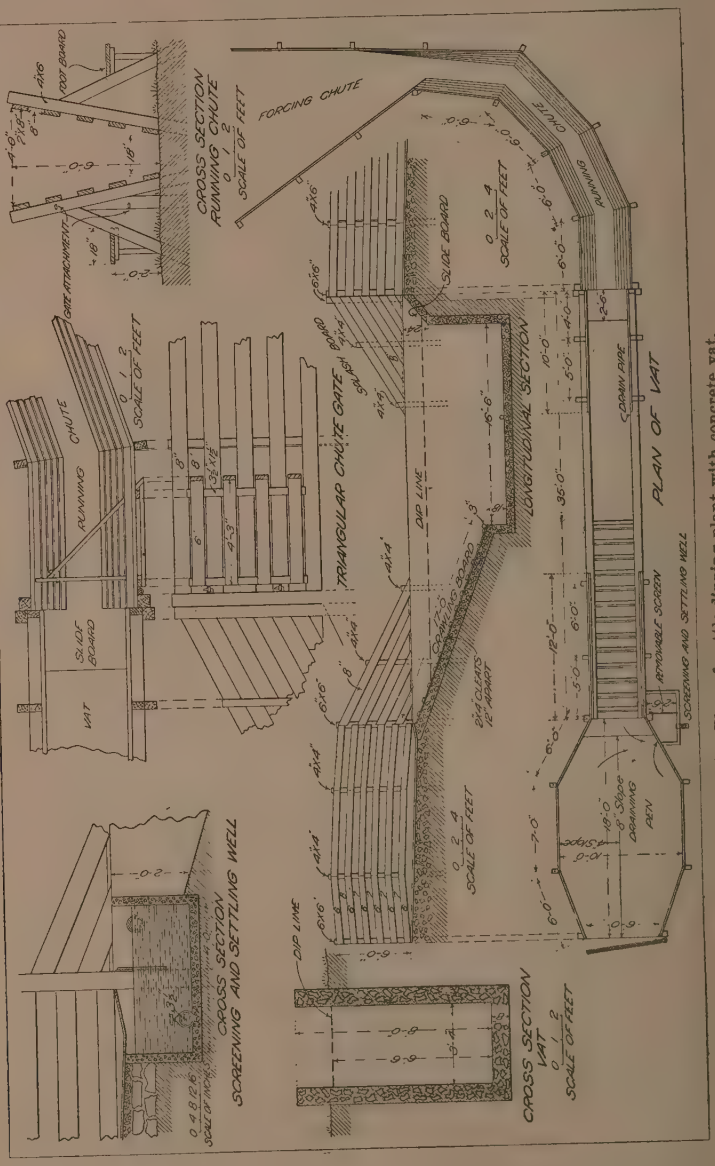

FIG. 11.—Plan of cattle-dipping plant with concrete vat.

prefer the triangular gate. A drop gate like that shown in figure 10 may be adapted for use either as a check gate in the chute or as

a holding gate in the vat. A holding gate in the vat located at the beginning of the exit incline is necessary only in case animals are to be dipped for scab, or when it is desirable that they be held in the dip longer than the time ordinarily required for passing through the vat.

DRAINING PENS.

When cattle emerge from the vat they carry out some of the dip, which runs off their bodies very rapidly. This dip should be saved

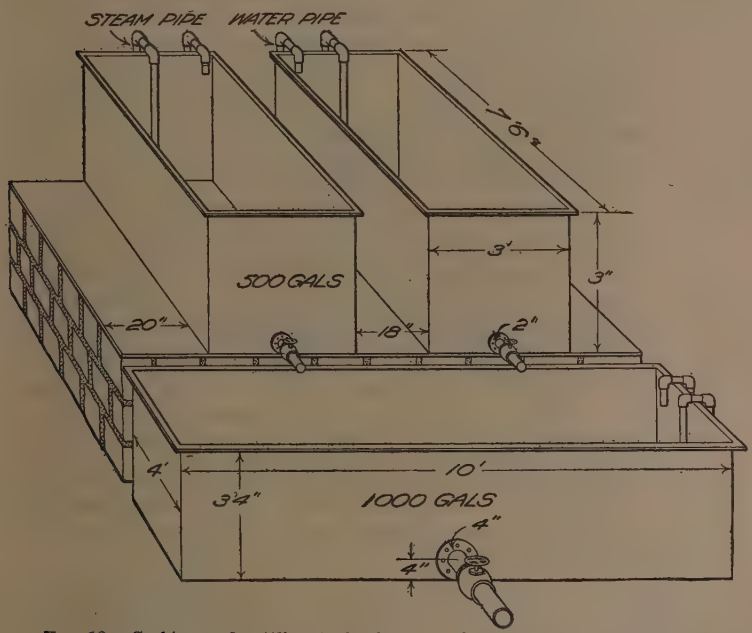

FIG. 12.—Cooking and settling tanks for general-purpose cattle-dipping vats.

and returned to the vat, not only because it may be used over and over again, but because if it is allowed to drip off in the holding corrals pools of dip collect from which the animals may drink with possibly injurious results, and even if no cattle are poisoned in this way the mud holes which form in the corrals are highly objectionable. Draining pens with water-tight floors sloping toward the vat or draining wells should be provided to catch and return the dip to the vat. The size shown in the plans may be increased or decreased to correspond to the length of the vat. The floors of the pens may be made of lumber or cement and should have settling wells or water traps to prevent rain water from running into the vat and diluting the dip. A design of a settling well is shown in connection with the

cement vat and one of a water trap with the wooden vat. The settling well may be used with the wooden vat, in which case the water trap would be unnecessary, as the settling well serves the same purpose.

In constructing the draining pens of cement it is advisable to build the outer walls in the same manner as the foundations for a house, except that they are to be 8 inches thick. The space inside the walls is then filled with gravel to the required height and the sloping floors laid on the tamped gravel. To prevent slipping the cement floors should be roughened with a stiff broom while the concrete is soft, or a coat of pebble dash may be applied.

If wooden floors are used they should be double with a layer of tar paper between the two floors. Rough lumber may be used for the lower floor, but the top one should be of matched boards 1 inch thick. Cleats should be nailed on the floor to prevent the cattle from slipping.

VATS.

The dipping vat may be constructed either of cement or of lumber—the cement vat being preferable, as when properly made it is more durable and in many other ways more satisfactory than a wooden vat. The sides may be perpendicular, as shown in the plans for a cement vat (fig. 11), or sloping, as shown in those for a wooden vat (fig. 10). Sloping sides are generally considered more desirable than perpendicular ones for either cement or wooden vats. Both styles, however, are shown in the drawings, because some stockmen prefer vats with perpendicular sides. The dimensions shown in the cross section of the wooden vat may be followed in constructing a cement vat with sloping sides.

The length of the vat may vary from 24 to 100 feet, depending on the number of cattle to be dipped. The top may extend 9 to 18 inches above the surface of the ground or may be flush with it. A vat of the former kind affords better conditions for handling the cattle than one of the latter kind. If it is desired that the top be flush with the ground, the vat should be built so it extends 5 inches above the natural surface of the ground, which is then graded up with gravel or cinders and a dry path along each side of the vat thus provided.

The slide board should be made of or covered with a smooth-surfaced material, such as planed lumber or sheet metal. A piece of boiler plate makes an excellent slide board. The dimensions of the slide board shown in connection with the cement vat are those commonly used. A short, steep slide board causes the animals to plunge abruptly into the dip, while a long gradual slope allows them to slide in more gently. The short, steep slope has the advantage

that the animals can not brace themselves on it for a leap as easily as on the long, gradual slide.

The exit incline or crawling board in small vats should be about 16 feet long, so that the incline may not be too steep. In cement vats a false floor to which the cross cleats are nailed is usually laid on the exit incline. Bolts should be embedded in the concrete for fastening the false floor. The plans for the concrete vat show the lower end of the floor held in position by a cross pipe embedded in the concrete and the upper end and middle held by bolts.

If permanent pipes are used for conducting water and dip to the vat they should be laid so as not to act as obstacles to the men working along the vat. There should be no obstruction in the path along both sides of the vat; neither should there be any cross pieces over the top of the vat that may interfere with the proper handling of the cattle while they are in the dip.

The wooden vat shown in the plans has sloping sides, but, as already stated, they may be made perpendicular if desired. When soft wood is used for the frame timbers they should be 6 by 6 inches, but if hard wood is used 4 by 4 inch timbers are sufficiently large for the purpose. Cedar posts make good framing timbers, as they do not rot rapidly. Matched planks 2 inches thick should be used in building the vat, and they should be beveled so that all joints and seams may be properly caulked with oakum and rosin or similar material.

A water trap with hinged cover is shown in the exit incline of the wooden vat. While dipping is in progress both the cover and the valve to the drain pipe should be closed, but when dipping is finished for the day both should be opened so that water from the draining pens in case of rain may not run into the vat and dilute the dip.

Heating equipment is necessary in the case of those dips which are used warm. That shown in the plans of the wooden vat may also be built in connection with a cement vat. When the open-tank heating system shown in the plans is used settling wells are not necessary, as the heating tank answers the purpose of a settling well. This system has an advantage over the old-style coil heater in that the pipes may easily be kept from clogging. Another method of heating, and the one usually employed, is to install a 25-horsepower boiler and to pipe the steam to the vat, where it discharges into the dip through perforations in a pipe laid along the bottom of the vat for about two-thirds its length. The water condensing from the steam passing into the vat from the boiler dilutes the dip to a slight extent, and for this dilution an allowance should be made in replenishing the dip.

The trench for the vat should be excavated so that the inside dimensions correspond with the outside dimensions of the com-

pleted vat. If the sides of the trench are reasonably firm they may be used for the outer walls of the form, but in all cases where the vat is extended above the surface of the ground it is necessary to build forms extending from the ground surface to the top of the vat. If the soil is sandy or the walls cave in it will be necessary to use outer forms, in which case the trench should be wide enough to allow for these forms.

The forms usually are made of 1-inch boards and 2 by 4 inch braces, but as a supply of 2-inch lumber is necessary for the corrals and chutes, some of this lumber may first be used for the forms and

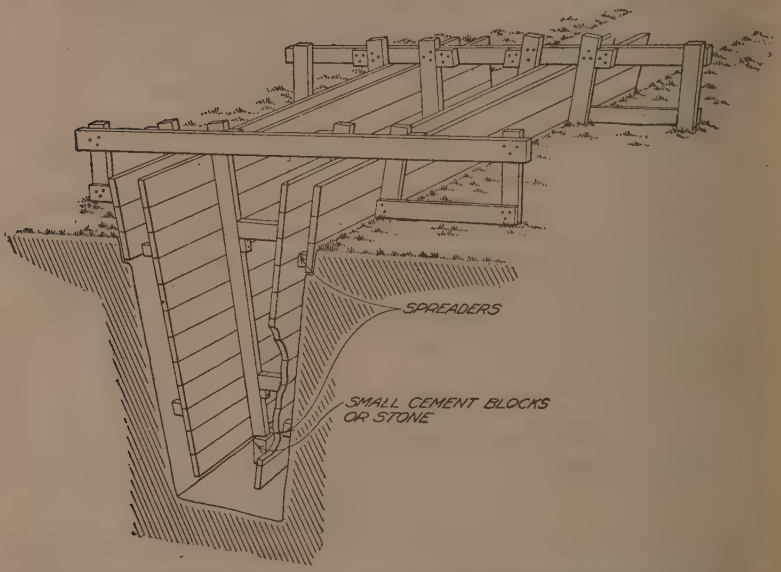

FIG. 13.—Section of trench for concrete vat with sloping sides, showing the forms in place, and one method of bracing. (Compare with fig. 14.)

afterwards for constructing corrals and chutes. Two methods of bracing the forms are illustrated (figs. 13 and 14).

Bolts for fastening the crawling and slide boards and the drain and other pipes should be placed in position in the forms before the concrete is laid. The concrete side and end walls may be reinforced with heavy woven wire, in which case the reinforcements should be placed properly in the forms so that they may be embedded in the middle of the walls.

The concrete for dipping vats should be made of 1 part of Portland cement by measure, 2½ parts of sand, and 4 parts of screened gravel or crushed stone. The sand should be coarse, clean, and free from foreign matter. The crushed stone or gravel may vary in size

from one-quarter to 1 inch in diameter. The mixing should be done on a smooth, tight, platform and the sand and rock measured separately in a bottomless box 2 feet long, 2 feet wide, and 1 foot deep, having a capacity of 4 cubic feet. For 2½ cubic feet mark the inside of the box 7½ inches up from the bottom. Each sack of Portland cement is considered equal to 1 cubic foot. Mix thoroughly the sand and cement, add the crushed stone (previously drenched with water), and mix the whole mass by turning it several times with shovels. Then add water in a depression made in the center of the pile and mix well by turning several times with shovels, adding sufficient water during the mixing to make a quaky or thin jellylike mixture.

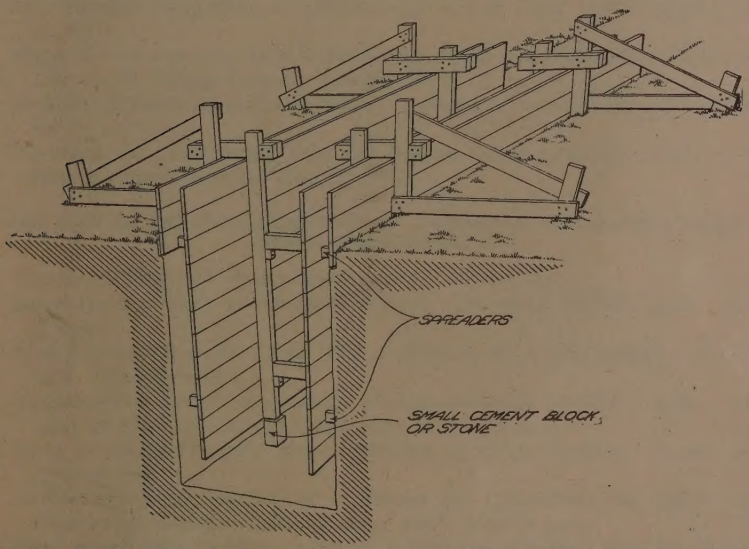

FIG. 14.—Section of trench for concrete vat with perpendicular sides, showing the forms in place and another method of bracing. (Compare with fig. 13.)

The placing of the concrete in the forms should be commenced as soon as the mixing is finished. The floor and exit end should be laid first and the concrete well tamped. In filling the forms the concrete should be settled into place by spading rather than tamping, and special attention should be given to spading next to the inside forms to force back the coarse particles and allow the sand-cement mortar to form a dense, water-tight surface. An old hoe straightened out makes a good spading tool, as the handle is long enough so that the bottom of the forms may be reached. If it is necessary to stop work for the day before the forms are filled, the surface of the concrete in the forms should be roughened with a stick. Just before placing additional concrete wash the roughened

surface and paint it with cement and water mixed to the consistency of thick cream. Leave the forms in place two or three days, if possible, and wet the concrete daily. After the forms are removed, dampen the surface of the concrete and apply a finishing coat composed of 1 part of cement and 2 parts of sand, or mix cement and water to the consistency of cream and apply it, brushing well to form a smooth surface.

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